NPS MDP Study
Outbrief Schedule, 1 JUN 2005

0800-0815 Introductions

0815-0915 Background/Results

0930-1015 Cargo Inspection System (Land)

1030-1130 Cargo Inspection System (Sea)

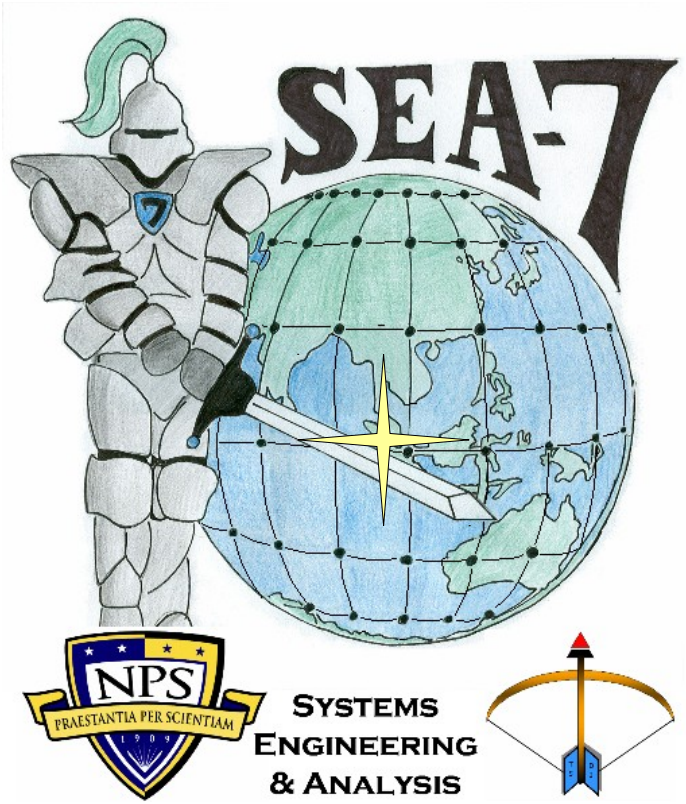
1130-1230 **LUNCH**

1230-1330 Sensor System

1345-1445 C3I System

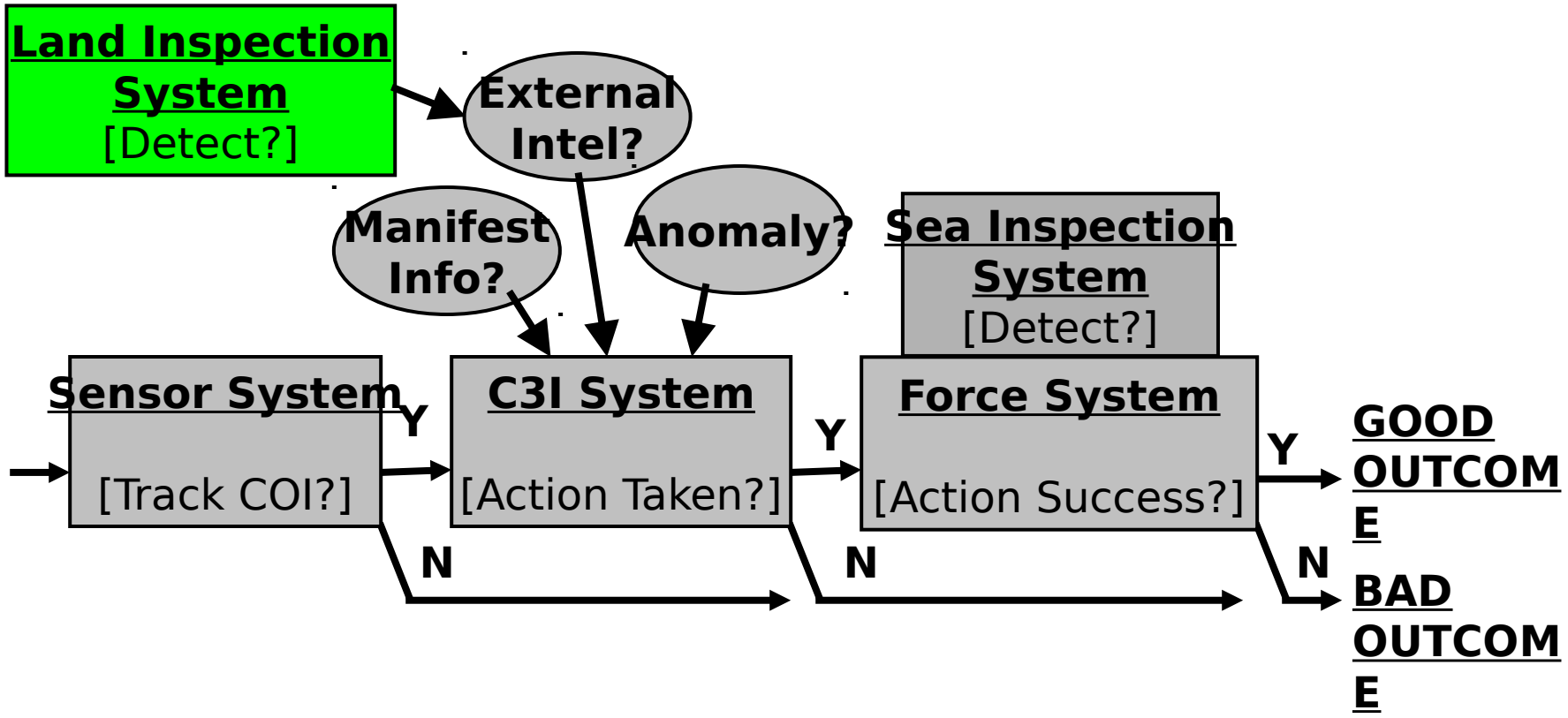
1500-1600 Response Force System

NPS MDP Study
Land Inspection Group



LT William Westmoreland, USN

MDP System Operational Architecture



Land Inspection Agenda

- System Insights
- Objectives/Requirements
- Functional Decomposition
- Alternatives Generation
- Model Overview
- Model Assumptions and Factors
- Results
- Conclusions/Insights

NPS MDP Study System Insights

Land Cargo Inspection

- Effective Cargo Inspection requires industry cooperation

Sea Cargo Inspection

- Enroute at-sea Cargo Inspections can be effective using current handheld sensor technology

Land System Group Objectives

- Characterize cargo security and inspection process
- Identify methods to improve container security and inspection efficiency
- Develop model for land inspection system
- Determine driving factors for land inspection system
- Recommend system alternatives to improve land inspection performance

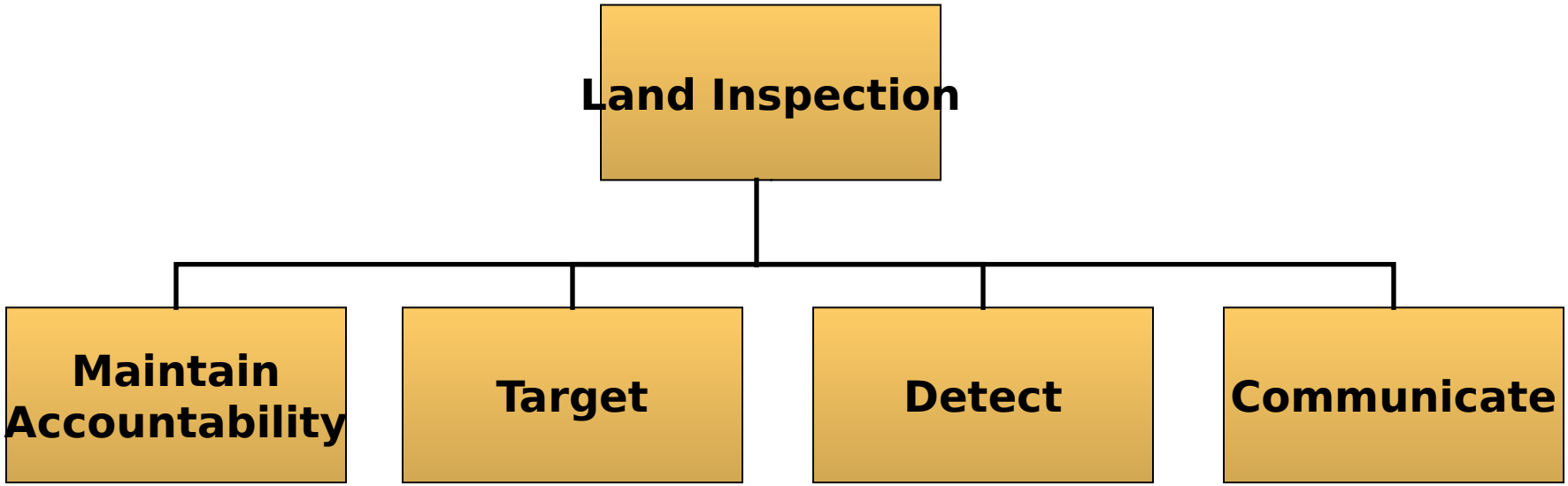
Land System Requirements

- Implement within five years
- Maximize detection of hazardous materials (CBRNE)
- Minimize delay
- Screen, target, and inspect cargo containers
- Provide information about containers, shippers, and carriers

Land System Objectives

- Increase the number of containers inspected
- Communicate results
- Dedicated resources for analysis of sensor data
- Improve intermodal security of containers
- Flexible

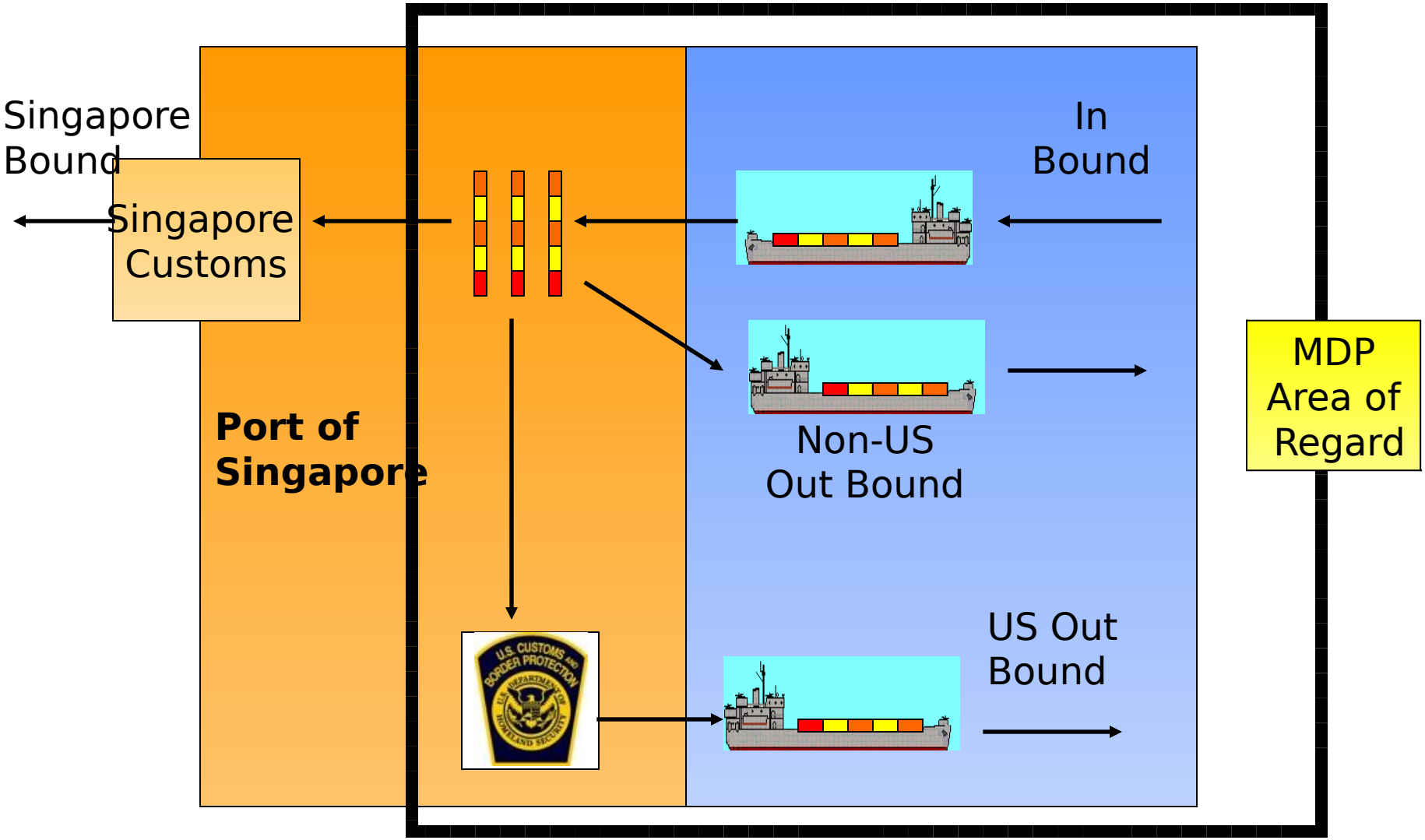
Functional Decomposition



Port of Singapore “As-Is”

- Container Security Initiative participant
- Five container terminals – Mostly “Hub” transfer traffic
- Utilizes Free Trade Zones (FTZ)
- Only 1.4 % of containers inspected
- Limited chemical/biological detection capability
- Use x-ray & gamma ray imagers, radiological detection pagers, and canines

Land Inspection “As-Is”



Land System Alternatives Generation

TARGET	
Container History	Verification Method
Origin	Human Intelligence
Route	Surveillance System

DETECT			
Nuclear/Radiation	Chem./Bio.	Explosives	Foreign Objects
Gamma-Ray Imager	Optical	Flash Chromatography	X-Ray Machine
High Purity Germanium	Arrays		
Scintillation Counter	Flame Emission		

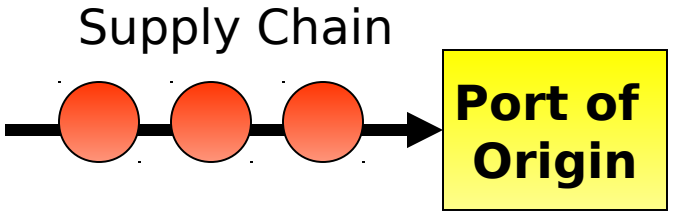
COMMUNICATE	
Receive/Transmit	Record/Display
Infrared	Computer Database
Radio (UHF, etc.)	Voice/Video Recorder
Encoded Laser	Monitors
Cable/Fiber	Audio/Visual Alarms
Satellite Communications	
Cell Phones	
Internet	
Verbal/Visual	

MAINTAIN ACCOUNTABILITY	
Track	
Automated	Interpretation
Sensor Mapping	Human Search
Data Analysis	Imaging Display
Smart Container	Intelligence
RFID	Sickness Locality

Land System Alternatives Overview

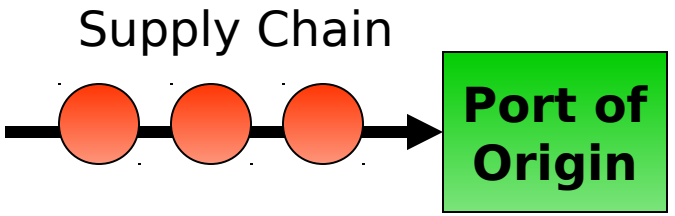
As-Is System

- **Implement CSI concept**



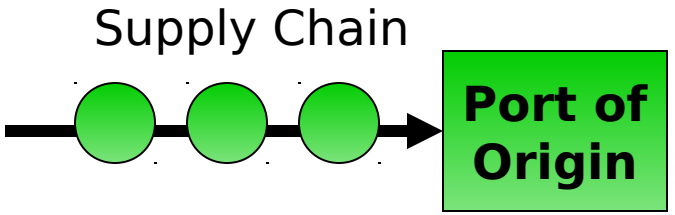
ALT 1: "Port-Centric"

- **Inspections occur in ports**
- **Intelligence limited**



ALT 2: "Trusted Agent"

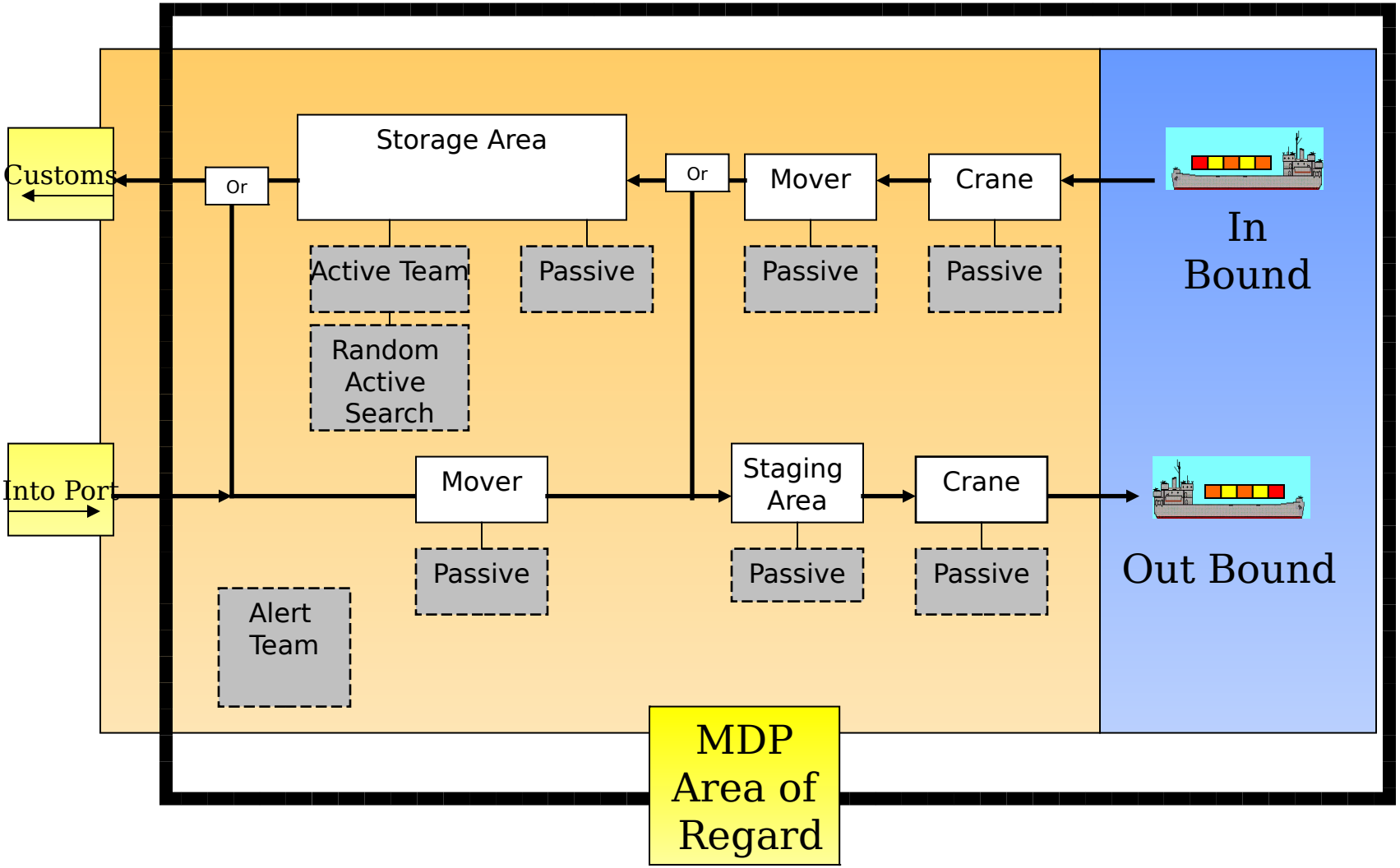
- **Enhanced security measures**
- **Heavy reliance on**



ALT 1 -Port Centric Inspection

- Layered security integrating passive/active sensors
- Inspections occur during normal container operations
- Intelligence limited
- Port-centric security

ALT-1 Port-centric Inspection



ALT 2 – Trusted Agent

- Layered security integrating passive/active sensors
- Inspections occur during normal container operations
- Targeting or selection of searched containers based on:
  - Container seals
  - Manifest Discrepancies
  - Certified Shippers
  - 2-3% randomly inspected
- Hybrid of port-centric inspection and supply chain security

Trusted Agent

- Procedural Security
- Physical Security
- Personnel Security
- Education and Training
- Access Controls
- Manifest Procedures
- Transportation Security

SENSORS CONSIDERED

1.Gas Chromatography / Ion Mobility Spectrometer

2. Radiation Pager

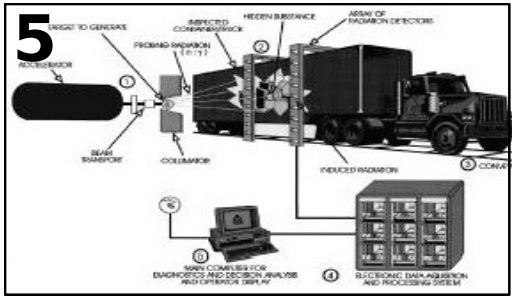
3. X-Ray Detector

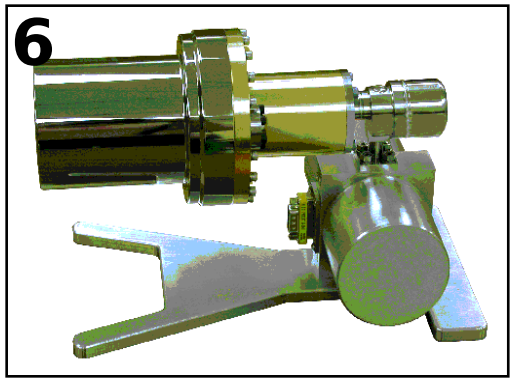
4.Gamma-Ray Detector

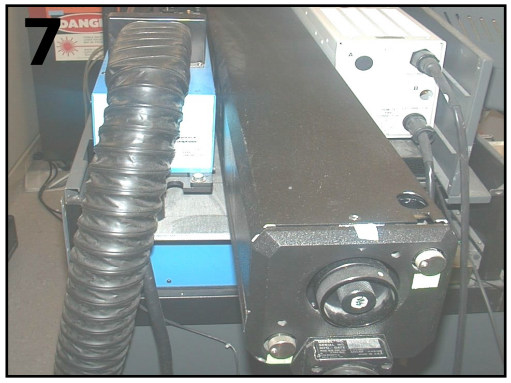
5.Pulsed Fast Neutron Analyzer

6.High Purity Germanium Detector

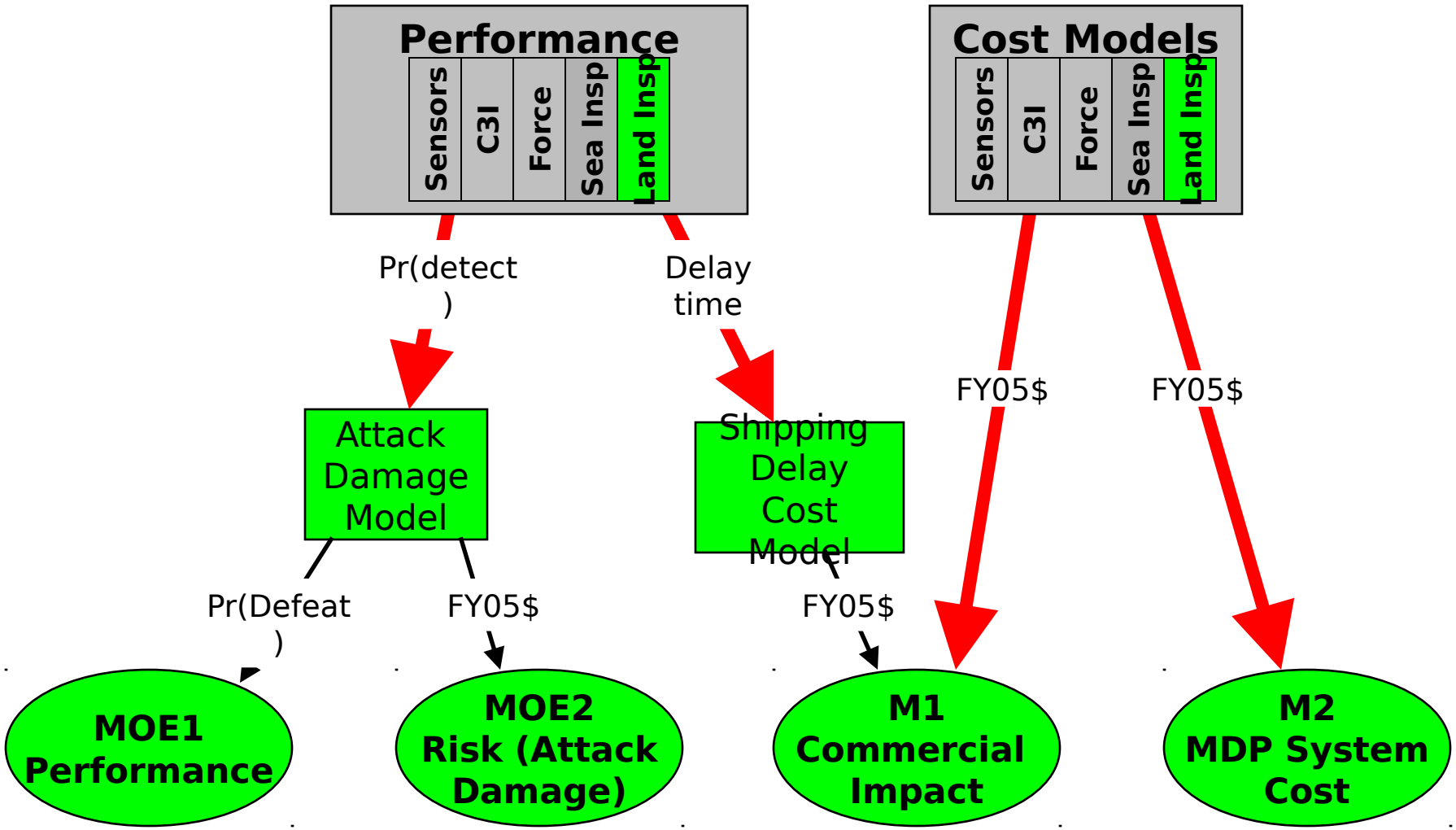
7.Flow Cytometry





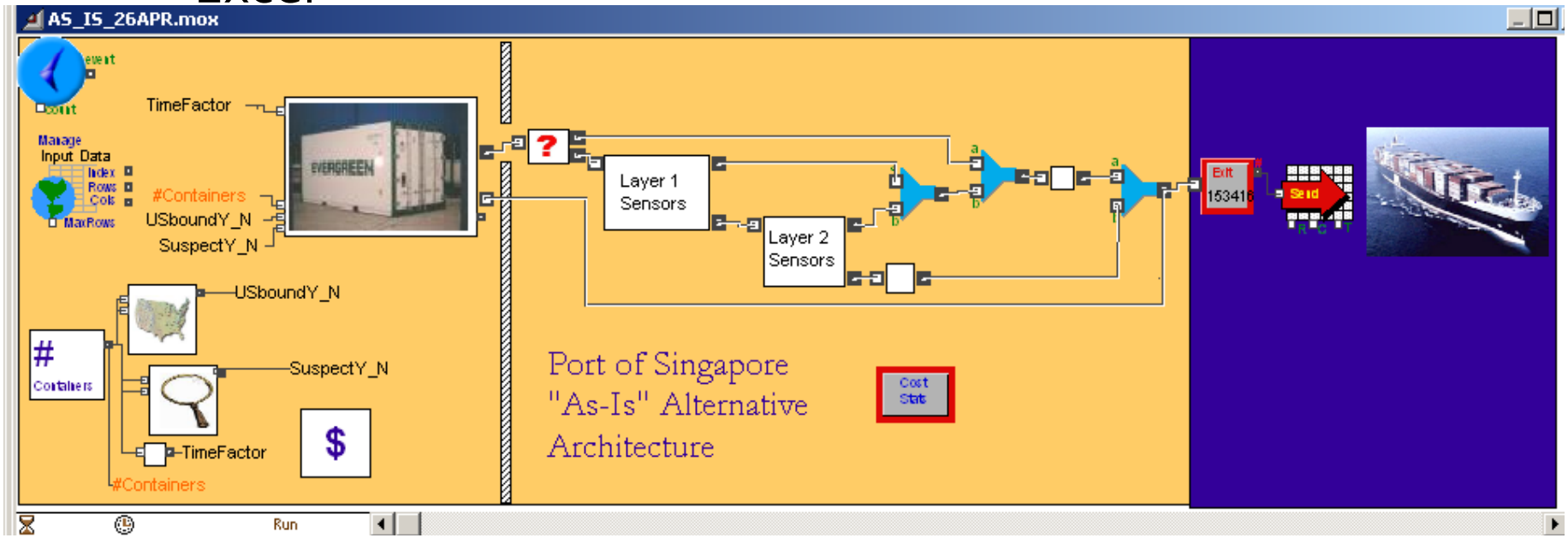


Overarching Modeling Plan



Model Overview

- **Approach**
  - Performance and Delay Cost
- **Models Used**
  - EXTEND v6 Model
  - Excel



Land System Model Assumptions

- Based on Port of Singapore:
  - 2004 Port operations procedures.
  - 2004 port statistics.
  - Percentage of containers sent to temporary storage
  - Average container value of $25 K
  - Inspection times based on port operations

Land Inspection Factors

- Number of inspection teams
- Number of sensors
- Percentage inspected randomly
- P(d) & P(fa) for sensors
- Container throughput per month
- Inspection time per sensor

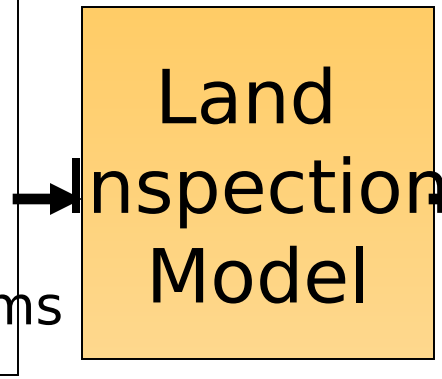
** Varied factors in red

- Number of cranes and movers
- Percentage of containers in storage
- Days in storage
- Probability of given threat
- Container value
- Number of ports

Land Performance Model Overview

Input Variables

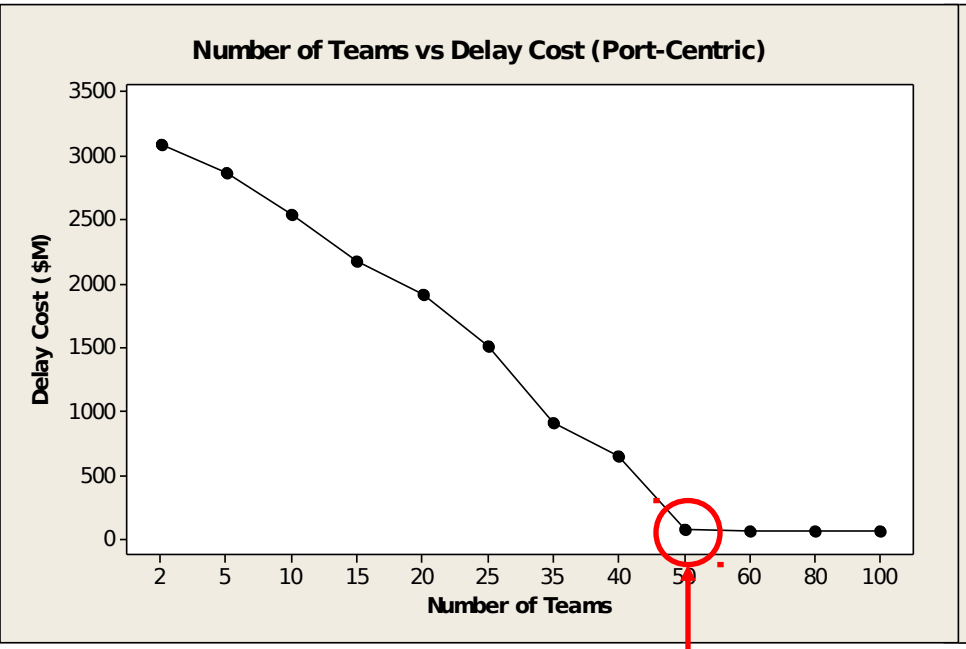
- Number of Sensors
- Sensor Pd
- Number of Containers
- % Random Inspected
- Number of Active Teams

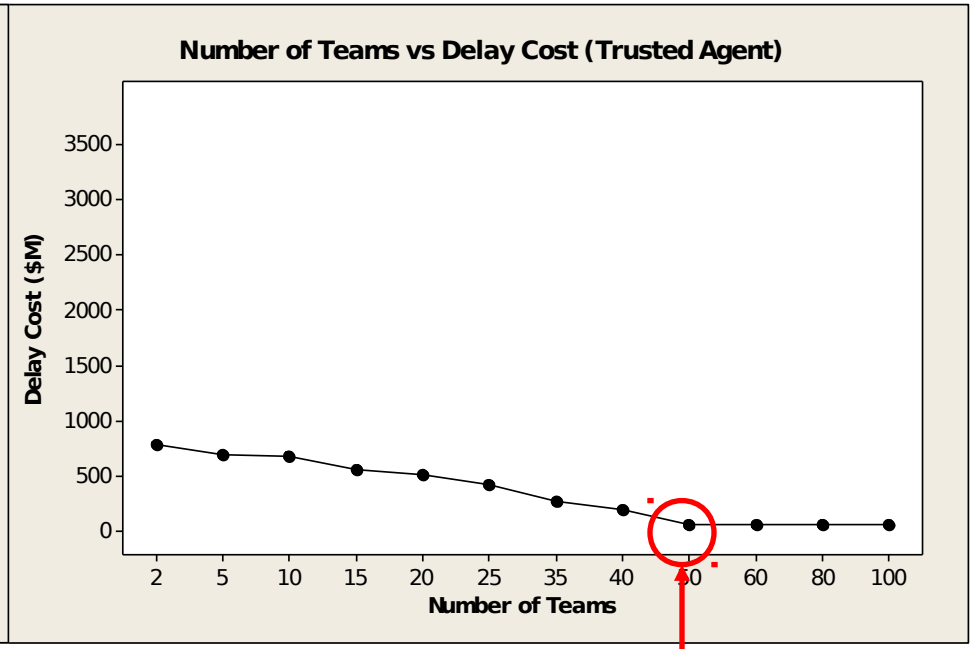


Outputs

- P(Detection)
- Delay Time
- Commercial Cost
- System Cost

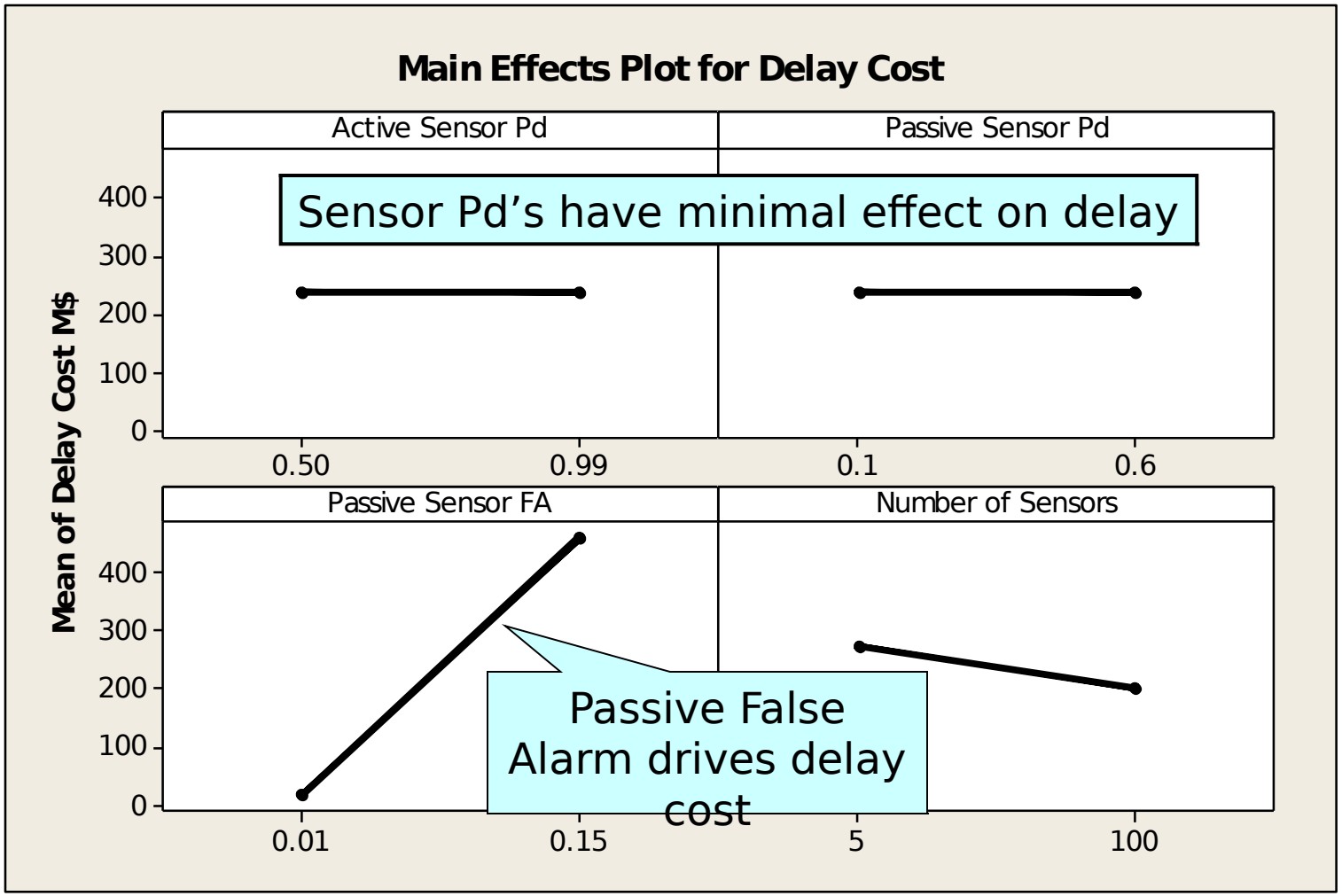
Land System Model Results



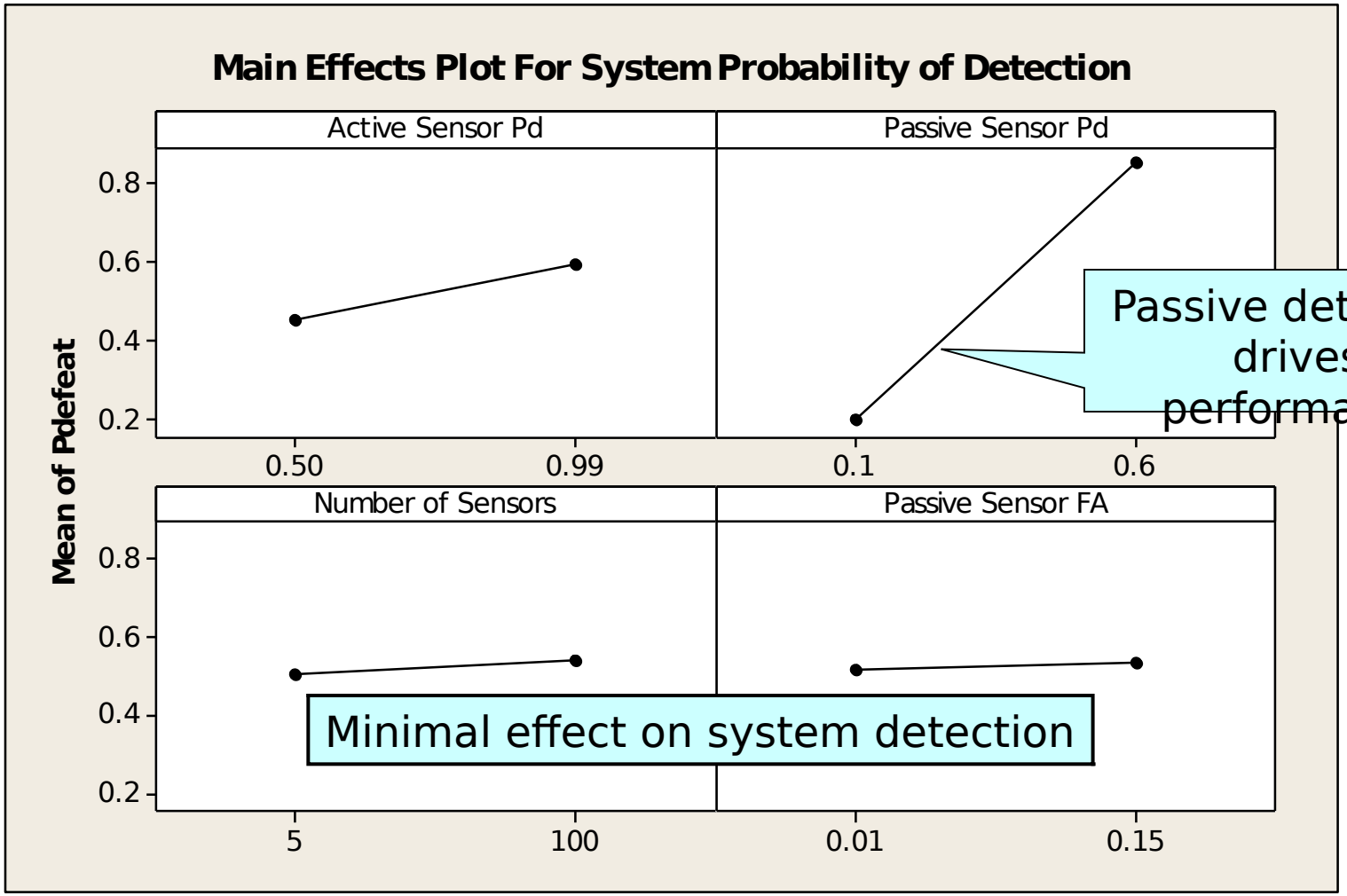


50 teams minimize delay cost

Land System Inspection Results



Land System Inspection Results



Land Inspection System Variable Values

		Values		
Factors	Values Evaluated	As-Is	Alt 1	Alt 2
Number of Sensors	2-100	5	50	50
Active P(detection)	.3, .4, .5, .6, .85, .99	0.99	0.85	0.85
Active P(false alarm)	0.01	0.01	0.01	0.01
Passive P(detection)	.1, .6	0	0.6	0.6
Passive P(false alarm)	.01, .15	0	0.01	0.01

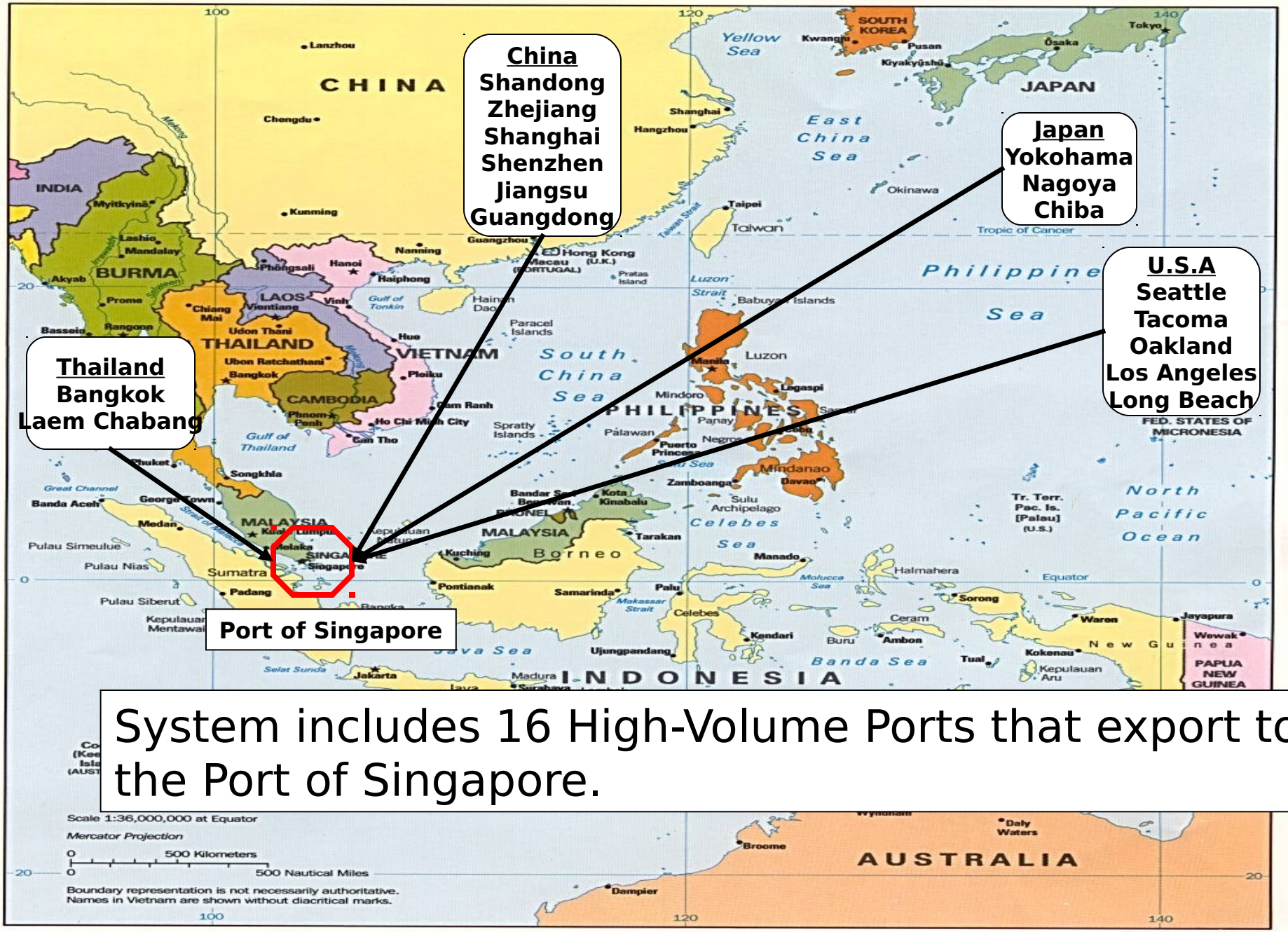
Land System Single Port Use Case: Port of Singapore

System confined to the Port of Singapore

Land System Results
Single Port*

MOE / Metric	**'As-Is'**	**ALT 1**	**ALT 2**
Percent Cargo Inspected	6%	99%	99%
P(Detect I Inspect)	99%	87%	93%
P(Detect)	6%	87%	93%
Comm. Delay Cost ($M)	~0	1,921	1,688
Comm. Cost ($M)	0	0	1,753
Land System Cost ($M)	38	1,143	1,150
Total System Cost ($M)	38	3,064	4,591

* Modeled after the Port of Singapore

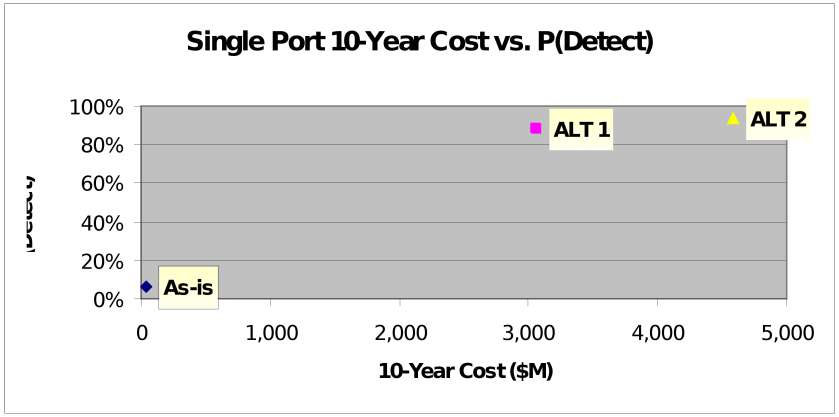


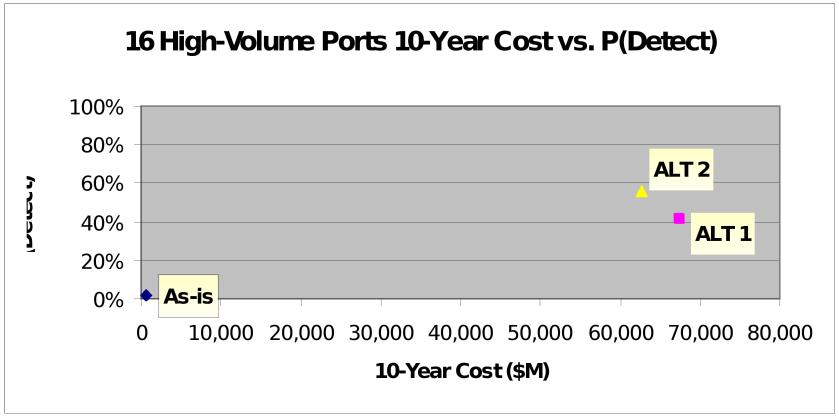
System includes 16 High-Volume Ports that export to the Port of Singapore.

Land System Results:
Inspections in 16 Highest-Volume Ports-of-Origin

MOE / Metric	**'As-Is'**	**ALT 1**	**ALT 2**
% Inbound Cargo Inspected	2%	47%	74%
P(Detect I Inspect)	99%	88%	94%
P(Detect) all inbound cargo	2%	41%	56%
Comm. Delay Cost ($M)	~0	30,730	27,019
Comm. Cost ($M)	0	0	1,753
Land System Cost ($M)	608	36,677	33,841
Total System Cost ($M)	608	67,407	62,613

Overall Results





Port system performance increases with cost

CONCLUSIONS

- Current System is inadequate in defeating an attack:
  - Container Volume
  - Detection Capabilities Limited
  - Costs Associated with Delay and False Alarm
- Best performance achieved through a layered defense of ‘Port Centric’ and ‘Intelligence’ systems

CONCLUSIONS

- Passive sensor P(d) drives system
- Passive sensor P(fa) impacts delay cost
- Effective supply chain security measures can reduce delay cost
- Increase in security measures will act to deter illicit trade which may result in lower system costs

RECOMMENDATIONS

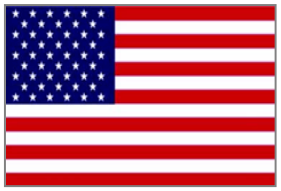
- Invest in passive sensor technologies
- Continue development of sensor technologies with penetration capabilities
- Offer incentives to industry

RECOMMENDATIONS

- Develop a method to test security measures
- More inspectors needed at domestic and international ports
- Countries would benefit from implementation of C-TPAT
- Research methods to decrease time to unload containers for inspection

Questions?

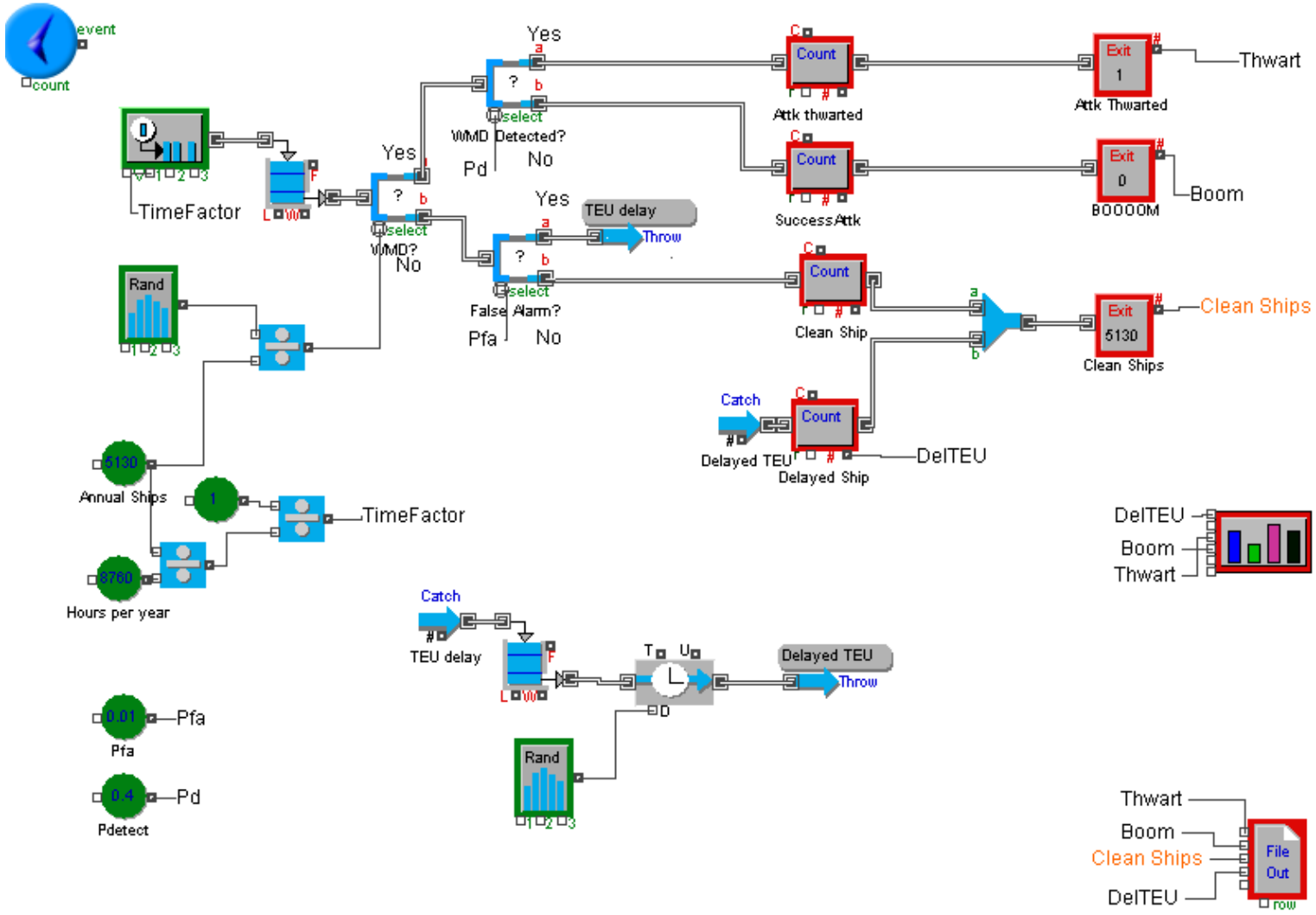
- LT William Westmoreland, USN
- LT Micah Kelley, USNR
- 1st LT Hasan Gungor, TuAF
- ENS Jared Wilhelm, USNR



Back-Up Slides

Original Model – Port of LA

- Considers single WMD
- Simple, baseline model

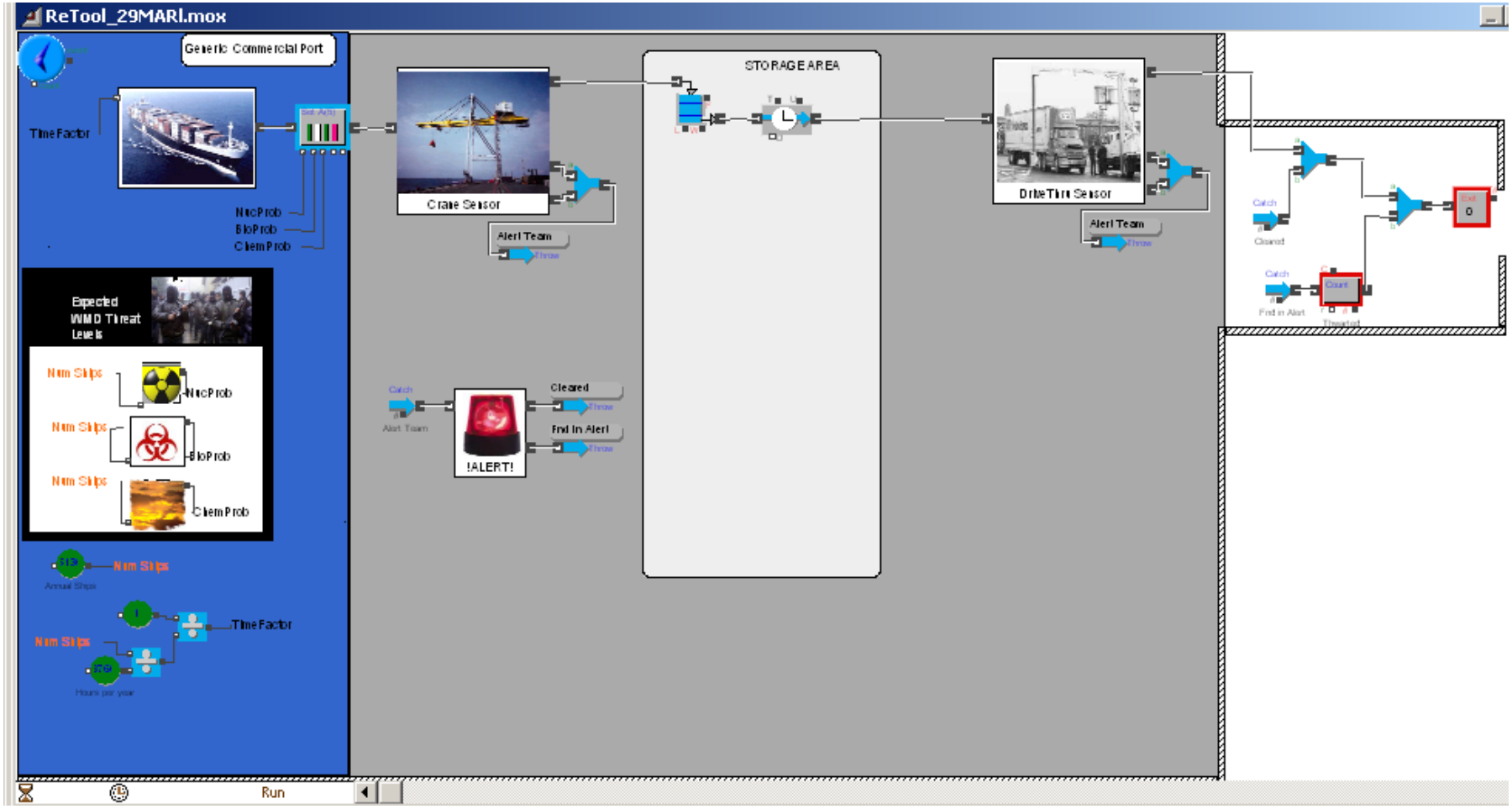


Second Generation Model – Port of LA Expanded

- **Considers Nuclear, Biological and Chemical WMD**

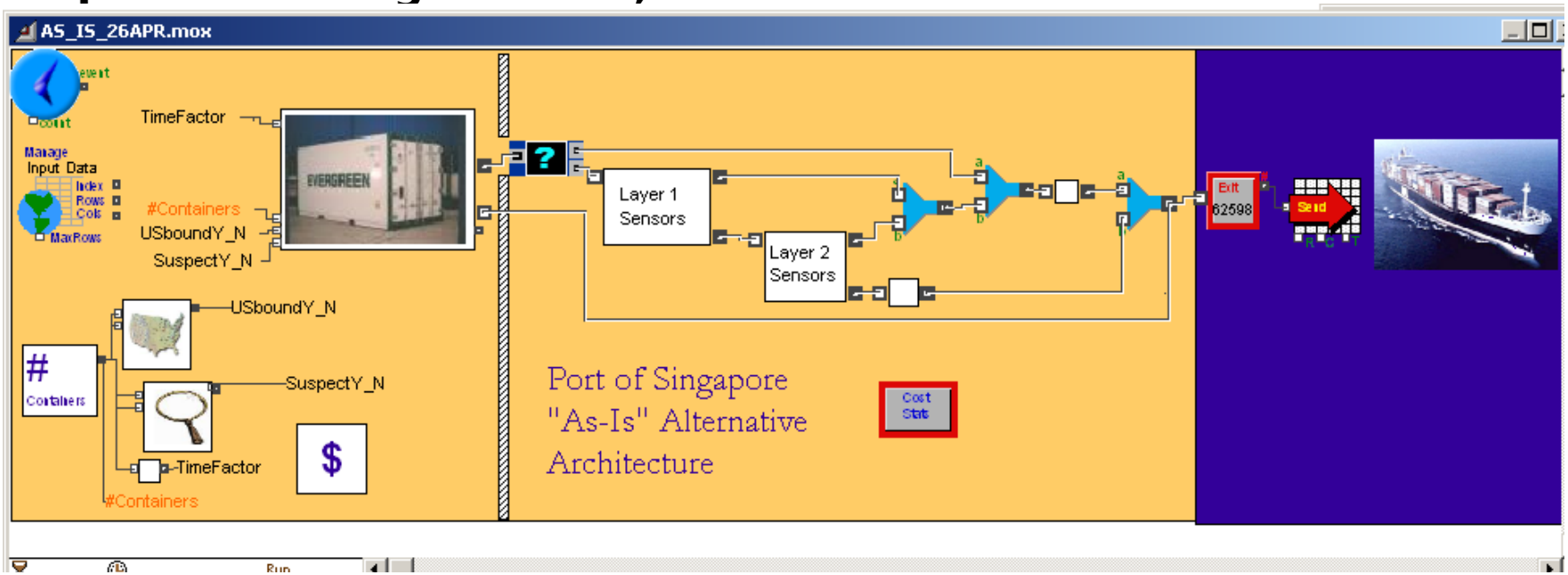
Third Model – Port of LA Expanded w/ Layered Sensors

- Considers Nuclear, Biological and Chemical WMD
- Adds in realistic sensing layers and alert team



Port of Singapore “As-Is” Model

- Nuclear, Biological, Chemical and Explosive WMD capability
- Develop to represent current system as close as possible using realistic, researched numbers

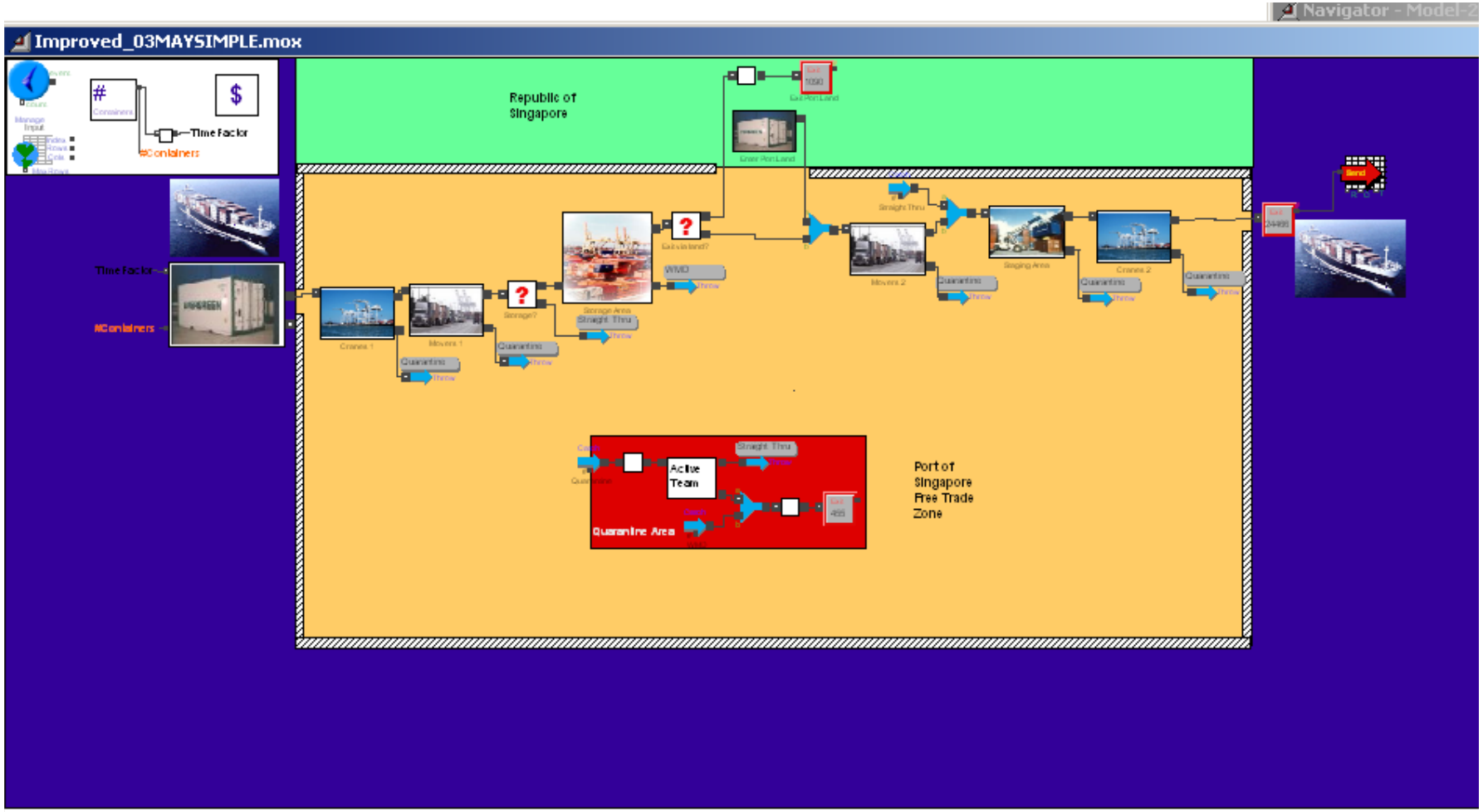


Excel Input File

Excel Output File

Alternative 1 Model

- Layered passive and active system
- Targets based on minimal intelligence… Port

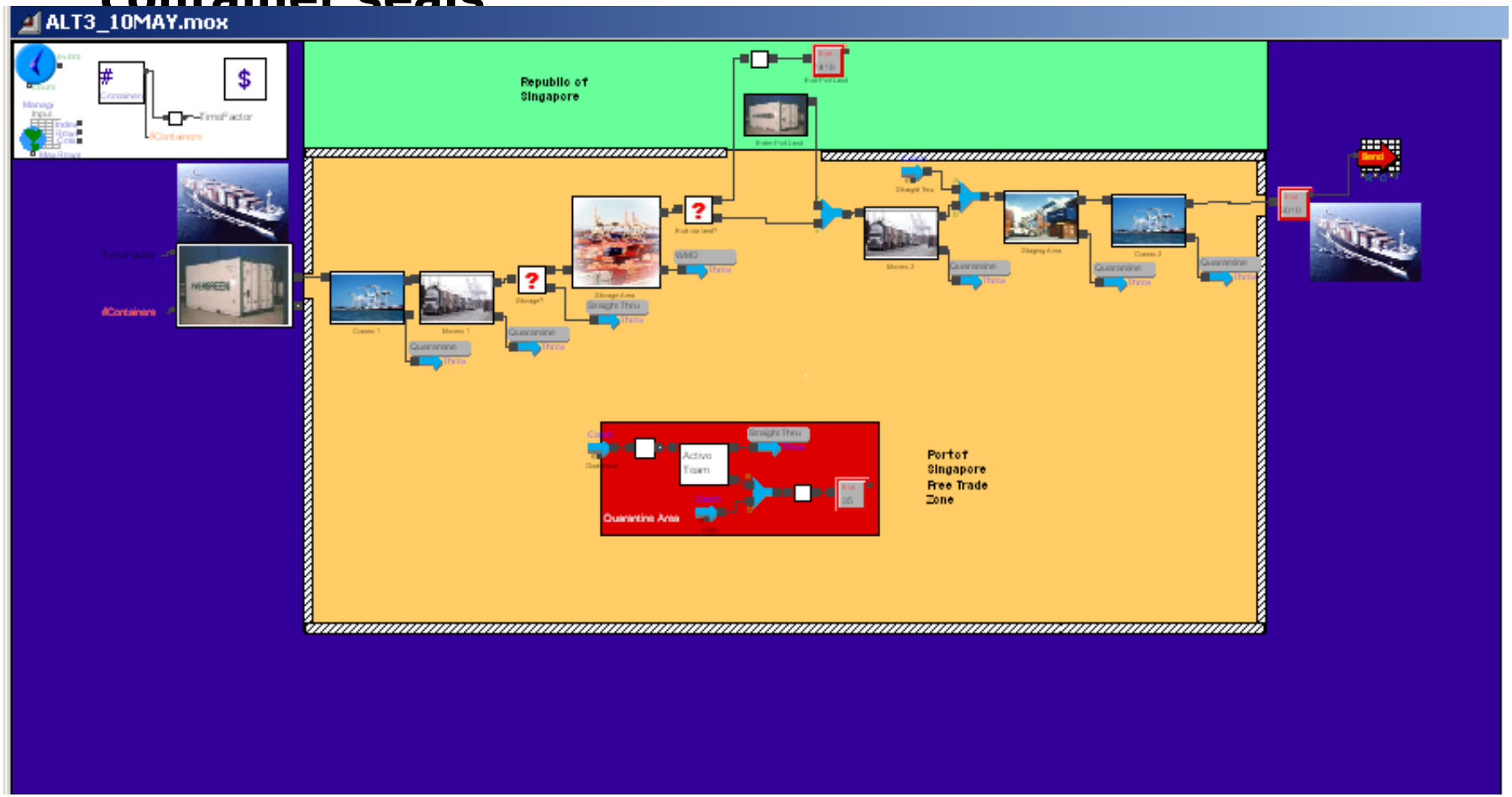


Excel Input File

Excel Output File

Alternative 2 Model

- Layered passive and active system
- Tagets based on intelligence, manifests and container seals



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